

QUICK-RELEASE JOINT FOR TWO TUBES

1 BACKGROUND OF THE INVENTION

2 1. Field of the Invention

3 The present invention relates to a quick-release joint, and more particularly to a
4 quick-release joint for coupling two tubes so the tubes can be separated or folded for
5 storage in a more compact space.

6 2. Description of Related Art

7 A conventional quick-release joint for combining two tubes includes a first
8 coupler securely engaged with a first tube, a second coupler securely engaged with a
9 second tube and connected to the first coupler by a hinge mechanism, and a fastener
10 selectively engaged with both the first and second couplers to secure the engagement
11 between the first coupler and the second coupler. The fastener includes a bolt and a
12 cover having a through hole to allow the bolt to extend therethrough. The cover has a
13 first side engaging with the first coupler and a second side engaging with the second
14 coupler such that after the cover engages with both the first and second couplers, the bolt
15 threadingly extends through the through hole to secure the engagement of the cover to
16 the first and second couplers. Thereafter the first tube and the second tube are securely
17 connected with each other via the joint. However, when reviewing the engagement of
18 the cover with both the first coupler and the second coupler, it is noted that the
19 engagement between the first coupler and the second coupler merely depends on the
20 cover and hinge so that after a period of time continuously bearing the force of
21 maintaining the engagement between the first coupler and the second coupler, the
22 fastener easily breaks or there will be misalignment or loose engagement between the
23 first tube and the second tube due to the wear of the fastener.

1 To overcome the shortcomings of the conventional joint, the present invention
2 intends to provide an improved quick-release joint to mitigate and obviate the
3 aforementioned problems.

4 SUMMARY OF THE INVENTION

5 The primary objective of the present invention is to provide an improved
6 quick-release joint for two tubes. The joint includes a first connector, a second
7 connector axially offset from the first connector, and a retainer engaged with both the
8 first and second connector to axially align the first connector with the second connector
9 so that the first connector securely couples to the second connector, which in turn
10 securely couples the first tube to the second tube.

11 In order to accomplish the aforementioned objective, the first connector has a
12 protrusion with an outer groove, and the second connector has an internal lip to
13 correspond to the groove on the first connector's protrusion. When the first connector
14 engages with the second connector, the protrusion is received in the second connector
15 with the lip away from the groove. After the retainer pushes the first connector to align
16 with the second connector, engagement between the lip and the groove secures the
17 engagement between the first connector and the second connector, which in turn secures
18 engagement between the first tube and the second tube.

19 Other objects, advantages and novel features of the invention will become more
20 apparent from the following detailed description when taken in conjunction with the
21 accompanying drawings.

22 BRIEF DESCRIPTION OF THE DRAWINGS

23 Fig. 1 is an exploded perspective view of the quick-release joint of the present
24 invention;

Fig. 2 is a schematic view showing the quick-release joint before alignment between the first connector and the second connector;

Fig. 3 is a schematic view showing the quick-release joint after alignment between the first connector and the second connector;

Fig. 4 is a perspective view of a second embodiment of the quick-release joint of the present invention;

Fig. 5 is a schematic view showing the quick-release joint in Fig. 4 before alignment between the first connector and the second connector;

Fig. 6 is a schematic view showing the quick-release joint in Fig. 4 after alignment between the first connector and the second connector; and

Fig. 7 is an exploded perspective view showing a third embodiment of the retainer of the quick-release joint of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

With reference to Fig. 1, the quick-release joint in accordance with the present invention has a first connector (10), a second connector (20) and a retainer (30).

The first connector (10) is adapted to securely connect to a first tube (not shown) and the second connector (20) is adapted to securely connect to a second tube (not shown). The purpose of the first connector (10) and the second connector (20) is to couple the first tube and the second tube in a strong, rigid manner.

The first connector (10) is a tubular object and has an internal lip (11) formed on an inner surface of the first connector (10) and a sleeve (12) formed on a side surface of the first connector (10). The sleeve (12) has a through-hole (121) on a common axis with the through-holes (211) on ears (21) of the second connector (20). Preferably, the internal lip (11) is inclined with respect to an inner face of the first connector (10). A first

1 recessed area (13) is defined in an outer surface of the first connector (10).

2 The second connector (20) is also a tubular object and has a pair of ears (21)
3 extending out from an outer surface of the second connector (20) and a protrusion (22)
4 formed on an inner surface of the second connector (20) and having a securing hole (220)
5 defined through the protrusion (22) to communicate with an inside of the second
6 connector (20) so as to allow a securing element (222), preferably a pin, to extend
7 therethrough, an outer groove (221) formed on the protrusion (22) next to a top surface
8 of the second connector (20). Preferably, the outer groove (221) has an opposite face
9 inclined with respect to the top surface of the second connector (20) resulting in the
10 bottom of the groove being narrower than the top. Each of the ears (21) has a through-
11 hole (211) with a common axis. A second recessed area (23) is formed on the outer
12 surface of the second connector (20) to correspond to the first recessed area (13) of the
13 first connector (10). The distance between the two ears (21) is larger than the
14 combination of the length of the sleeve (12) and the length of the compressed first spring
15 (24). A first spring (24) is provided between the two ears (21) and a securing element
16 (222) is provided to correspond to the through- holes (211) on the ears (21) and the
17 through-holes(121) on the sleeve (12).

18 The retainer (30) includes a push (31), a handle (32) with an offset rotating axle
19 (301), and a bolt (33) rotatably received in the offset rotating axle (301) and extending
20 out of the handle (32) and having two threaded ends. A second spring (34) is provided
21 between the inner face of the push (31) and the second recessed area (23).

22 When the quick-release joint of the present invention is in assembly, the
23 securing element (222) extends through the through-hole (211) of one ear (21), the
24 sleeve (12), the first spring (24) and into the through-hole (211) of the other ear (21) and

1 then the securing element (222) is securely positioned between the two ears (21). As
2 mentioned earlier the distance between the two ears (21) is larger than the length of the
3 sleeve (12) plus the length of the compressed first spring (24) so that after the sleeve (12)
4 is secured between the two ears (21) by the securing element (222), the sleeve (12) is
5 pushed by the first spring (24) and thus held against one of the ears (21).

6 The bolt (33) then extends from the inner surface of the second connector (20),
7 through the second spring (34), the push (31) and into the handle's (32) rotating axle
8 (301). After the bolt (33) threads into the rotating axle (301), the handle (32) is secured
9 to the bolt (33) and is rotatable with respect to the bolt (33) and rotating axle (301). Then,
10 the securing element (222) extends into the securing hole (220) to abut an outer
11 periphery of the bolt (33), preventing the bolt (33) from rotating, to secure the position
12 of the bolt (33) inside the second connector (20).

13 After the assembly of the quick-release joint of the present invention, it is seen
14 from Fig. 2 that the first connector (10) is axially offset from the second connector (20)
15 due to the force of the first spring (24) acting on both the sleeve (12) and on one ear (21).
16 However, the protrusion (22) extends into the first connector (10). It is further noted that
17 the push (31) has an arcuate shape and is received in the second recessed area (23) of the
18 second connector (20) and the first recessed area (13) of the first connector (10). The
19 arcuate shape push has a convex surface engaging with a bottom face defining the
20 recessed area (13). The handle (32) has an offset rotating axle (321) resulting in a cam
21 action on the head, engaging with a concave surface on the push (31).

22 With reference to Fig. 3, when the handle (32) is rotated to the closed position,
23 the cammed head (321) pushes the concave surface of the push (31) and thus the convex
24 surface of the push (31) moves the first connector (10). The movement of the first

1 connector (10) axially aligns it with the second connector (20), which allows the internal
2 lip (11) to be received in the outer groove (221) of the protrusion (22). As a result of the
3 movement of the first connector (10), the convex surface of the push (31) engages with
4 both the bottom surface defining the second recessed area (23) and the bottom surface
5 defining the first recessed area (13). When the first connector (10) is moved by the push
6 (31), the first spring (24) and the second spring (34) are compressed such that when the
7 handle (32) is rotated to the open position, the force stored in the first spring (24) and the
8 second spring (34) returns the first connector (10) and the handle (32) respectively. After
9 the first spring (24) returns the first connector (10), the first connector (10) is once again
10 axially offset from the second connector (20). That is, when the first tube and the second
11 tube are securely coupled to each other, the first connector (10) and the second
12 connector (20) are axially aligned with one another due to the engagement between the
13 internal lip (11) and the outer groove (221). As a result of the engagement between the
14 internal lip (11) and the outer groove (221), the first connector (10) and the second
15 connector (20) are secured to each other. Again, because the engaging force between the
16 first and second connectors (10,20) depends on the internal lip (11) and the outer groove
17 (221), the retainer (30) bears no part of any forces exerted on the first connector (10) and
18 second connector (20) by the tubes (not shown). As a result, even after a long period of
19 time continuously using the quick-release joint of the present invention, the retainer (30)
20 will not wear or deform, and the connection between the first connector (10) and the
21 second connector (20) remains rigidly secured.

22 With reference to Figs. 4.5 and 6, the second embodiment of the present
23 invention is shown, wherein most structural relationship in this embodiment is the same
24 as that disclosed in the first embodiment. The only difference lies in that the first

1 connector (10) has an extension (14) integrally formed on an inner surface of the first
2 connector (10) and having a second outer groove (141) along a joint between the
3 extension (14) and the inner surface of the first connector (10). The second connector
4 (20) has, in addition to the protrusion (22) on the inner surface of the second connector
5 (20), a second internal lip (26) formed on the inner surface of the second connector (20)
6 to correspond to the second outer groove (141) of the first connector (10).

7 Therefore, after the assembly of the second embodiment of the quick-release
8 joint, the extension (14) extends into the second connector (20) and the protrusion (22)
9 extends into the first connector (10) while the first connector (10) is axially offset from
10 the second connector (20). After the rotation of the handle (32) to move the push (31),
11 the convex surface of the push (31) pushes the first connector (10) to axially align with
12 the second connector (20) and also to compress the first spring (24) and second spring
13 (34). Thus, the engagement between the second outer groove (141) and the second
14 internal lip (26) and the engagement between the internal lip (11) and the outer groove
15 (221) secure the connection between the first connector (10) and the second connector
16 (20).

17 With reference to Fig. 7, it is noted that the present invention includes a first
18 connector (40), a second connector (50) and a push (60).

19 The first connector (40) is a hollow cylinder and has a first protrusion (41)
20 formed and extending from a portion of an inner periphery of the first connector (40), a
21 first groove (42) defined at a joint of the first protrusion (41) and the inner periphery of
22 the first connector (40), a guide (43) formed on an outer face of the first protrusion (41)
23 and securely engaged with the bottom face of the first connector (40) and a first passage
24 (44) defined in the inner periphery of the first connector (40).

1 The second connector (50) is also a hollow cylinder and has a second protrusion
2 (51) formed and extending upward from a portion of an inner face of the second
3 connector (50), a second groove (52) defined at a joint of the second protrusion (51) and
4 the inner face of the second connector (50) to correspond to the first passage (44), a
5 guiding notch (53) defined in a bottom face of the second connector (50) to correspond
6 to the guide (44) and a second passage (54) defined in the inner face of the second
7 connector (50) to correspond to the first groove (42) of the first connector (40).

8 The push (60) includes a knob (61) and a bolt (62) having a first distal end
9 securely connected to the knob (61) and a second distal end extending into the second
10 protrusion (51) from an outer periphery of the second protrusion (51).

11 After the first protrusion (41) is extended into the second connector (50) where
12 an open space is defined without the formation of the second protrusion (51), the knob
13 (61) is rotated to further extend the bolt (62) into the second connector (50) so that the
14 second distal end of the bolt (62) abuts an outer periphery of the first connector (40) to
15 push the mating between the first groove (42) and the second passage (54) and the
16 mating between the second groove (52) and the first passage (44). In order to ensure the
17 mating between the first groove (42) and the second passage (54) and the mating
18 between the second groove (52) and the first passage (44), the guide (43) is moved along
19 the guiding notch (53). Whereby the first tube (not shown) securely connected to the
20 first connector (40) and the second tube (not shown) securely connected to the second
21 connector (50) are combined.

22 It is to be understood that even though numerous characteristics and advantages
23 of the present invention have been set forth in the foregoing description, together with
24 details of the structure and function of the invention, the disclosure is illustrative only,

- 1 and changes may be made in detail, especially in matters of shape, size, and arrangement
- 2 of parts within the principles of the invention to the full extent indicated by the broad
- 3 general meaning of the terms in which the appended claims are expressed.